

Listing of Claims

This listing of claims will replace all prior versions and listings of claims in the Application for patent.

1. (CURRENTLY AMENDED) A method of forming synthetic microspheres, comprising:
providing ~~an~~ a solid agglomerate precursor, wherein the agglomerate precursor comprises at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor includes ~~an~~ a solid agglomeration of at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor has an alkali metal oxide content of less than about 10 wt. % based on the weight of the precursor; and
firing the precursor at a pre-determined temperature profile sufficient to combine the aluminosilicate material with the binding agent so as to form a microsphere having a substantially spherical wall, a substantial void volume and an average particle diameter greater than 30 microns.
2. (ORIGINAL) The method of claim 1, wherein the firing step comprises firing the precursor at a temperature range of between about 600 to 2500 °C.
3. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a fluidized bed reactor.
4. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a vortex furnace.
5. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a heated vertical pipe.
6. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a fuel fired furnace.
7. (ORIGINAL) The method of claim 2, wherein the firing step further comprises firing the precursor for a period of about 0.05 to 20 seconds.

8. (ORIGINAL) The method of claim 1, further comprising providing a blowing agent and activating the blowing agent during the firing step so as to release a blowing gas, thereby forming at least one substantially enclosed void in the precursor.

9. (ORIGINAL) The method of claim 8, wherein the firing step comprises forming a molten skin around the precursor.

10. (ORIGINAL) The method of claim 9, wherein the blowing agent is activated during the formation of the molten skin.

11. (ORIGINAL) The method of claim 9, wherein the blowing agent is activated after the formation of the molten skin.

12. (ORIGINAL) The method of claim 9, wherein the blowing gas is substantially trapped inside the molten skin.

13. (CURRENTLY AMENDED) A method of manufacturing synthetic microspheres, comprising:

providing ~~an~~ a solid agglomerate precursor comprising a pre-determined amount of at least one primary component comprising an aluminosilicate and a pre-determined amount of at least one pre-selected chemical, wherein the at least one pre-selected chemical is combined with the primary component to form a mixture as an aqueous solution or paste and wherein the agglomerate precursor has an alkali metal oxide content of less than 10 wt. % based on the weight of the precursor;

drying the mixture at a temperature below 80 degrees Centigrade to form the agglomerate precursor to a first moisture level, the agglomerate precursor including at least one primary component bound to at least one pre-selected chemical; and

firing the agglomerate precursor so as to react the at least one pre-selected chemical to form substantially spherical microspheres having a substantial void volume and an average diameter greater than 30 microns.

14. (ORIGINAL) The method of claim 13, wherein the at least one pre-selected chemical comprises a binding agent.

15. (ORIGINAL) The method of claim 14, wherein the at least one pre-selected chemical further comprises a blowing agent, wherein the blowing agent, when reacted in the firing step, releases an amount of blowing gas, wherein the blowing gas expands the precursor thereby forming a plurality of microspheres with one or more substantially enclosed voids therein. 1
16. (CURRENTLY AMENDED) The method of claim 15 ~~claim 13~~, wherein the aluminosilicate in the primary component is selected from the group consisting of fly ash, basaltic rocks and combinations thereof, wherein the blowing agent is selected from the group consisting of powdered coal, carbon black, sugar, and silicon carbide, wherein the binding agent is selected from the group consisting of alkali silicates, hydroxides, and combinations thereof.
17. (ORIGINAL) The method of claim 13, wherein the firing step comprises firing the mixture at a temperature range of between about 600 to 2500 °C.
18. (ORIGINAL) The method of claim 13, further comprising rapidly cooling the synthetic microspheres after the firing step.
19. (ORIGINAL) The method of claim 15, wherein the blowing gas is selected from the group consisting of CO₂, CO, O₂, N₂, N₂O, NO, SO₂, H₂O, and mixtures thereof.
20. (CURRENTLY AMENDED) The method of claim 13, wherein drying ~~the precursor to a first moisture level~~ comprises drying the precursor to a moisture level of less than about 14 wt. %.
21. (CURRENTLY AMENDED) The method of claim 13, wherein the drying step further comprises drying the agglomerate at a temperature of about 350 to 400 °C. prior to the firing step.
22. (ORIGINAL) The method of claim 13, wherein the drying step comprises drying the agglomerate at a temperature of about 50 °C. prior to the firing step.
23. (ORIGINAL) The method of claim 13, wherein the drying step is configured to remove moisture from the precursor so as to substantially reduce rupturing of the agglomerates during the firing step.

24. (CURRENTLY AMENDED) A method of forming synthetic microspheres, comprising:
providing ~~an~~ a solid agglomerate precursor, wherein the agglomerate precursor comprises a primary component with at least one aluminosilicate material of a pre-selected particle size, a blowing agent configured to release a gas when activated and a binding agent, wherein the agglomerate precursor is formed by:

mixing the primary component, blowing agent and optionally binding agent ~~with~~
in water without alcohol into an aqueous solution or paste that forms to form a substantially homogenous mixture; and

drying the mixture to form the agglomerate precursor, the agglomerate precursor comprising bound particles; and

firing the precursor at a predetermined temperature and a predetermined period of time to activate the blowing agent to release gas, wherein the temperature is greater than 800 degrees Centigrade and the time is 20 seconds or less, thereby forming microspheres with an internal void and an alkali metal oxide content of less than about 10 wt. %

25. (CURRENTLY AMENDED) A method of forming synthetic microspheres, comprising:
providing an agglomerate precursor, wherein the agglomerate precursor comprises at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor is substantially dry with a water content of less than 3 wt.%, wherein the agglomerate precursor has an alkali metal oxide content of less than about 10 wt. % based on the weight of the precursor; and

firing the precursor at a pre-determined temperature profile sufficient to combine the aluminosilicate material with the binding agent so as to form a microsphere having a substantially spherical wall, a substantial void volume and an average particle diameter greater than 30 microns.

26. (PREVIOUSLY PRESENTED) The method of claim 1, wherein the agglomerate precursor has a water content of about 10 wt.% or less.